TABLE V-1

Summary of Studies on Acute and Subchronic Oral Exposure to Monochloramine

Mode of Administration	Species	Sex, Weight	Duration	Dose	Effect	Reference
Gavage	Sprague-Dawley rats	4 males/group, 150-170 g	1 dose	10 mg/L x 3 mL (0.18-0.2 mg/kg bw)	Significant increase in blood glutathione at 30 and 60 minutes (7.9 and 26%, respectively), but not at 15 or 120 minutes. No significant effect on blood osmotic fragility.	Abdel-Rahman et al., 1984
				20 mg/L x 3 mL (0.35-0.4 mg/kg bw)	Significant increase in blood glutathione at 15, 30 and 60 minutes (17, 15 and 25%, respectively) but not at 120 minutes. No significant effect on blood osmotic fragility.	
				40 mg/L x 3 mL (0.71-0.8 mg/kg bw)	Significant increase in blood glutathione at 15, 30 and 60 minutes (13, 17 and 33%, respectively) but not at 120 minutes. No significant effect on blood osmotic fragility.	
Oral/drinking water	African Green monkeys	5 males, 7 females, 3.0-5.7 kg	6 weeks	100 mg/L	No detectable effect in 18 hematologic tests.	Bercz et al., 1982
Oral/drinking water	CD-1 mice	10 males, 10 females	30 days	100x*	No significant differences in body weight; significant increase in liver weights in females; significant decrease in lung weights of both sexes; significant decrease in brain and kidney weights in males.	Miller et al., 1986
				400x*	No significant difference in body weight; significantly decreased kidney and liver weights in males and significantly increased ovary weights in females.	
Oral/drinking water	rat	NS	45 days	10, 50 or 100 mg/L	No effect on weight gain or hematologic parameters	Bull, 1980

TABLE V-1 (cont.)

Mode of Administration	Species	Sex, Weight	Duration	Dose	Effect	Reference
Oral/drinking water	B6C3F1 mice	10/sex/group	91 days	25 and 50 mg/L	No adverse effects	GSRI, 1981
				100, 200 and 400 mg/L	Chronic liver inflammatory changes; increased frequency of mitotic figures, hypertrophy and bizarre chromatin patterns; decreased liver weights at 400 mg/L in males and $\geq$100 mg/L in females.	
	Fischer 344 rats			25, 50 and 100 mg/L	No adverse effects	
				200 and 400 mg/L	Decreased body weights; trend toward reduced liver size but not significant.	
Oral/drinking water	Sprague-Dawley rats	10/sex/group	90 days	25 mg/L	No adverse effects	Daniel et al., 1990
				50 mg/L	Significant reduction in body weight gain in males. Males had decreased absolute lung weights.	
				100 mg/L	Significant reduction in body weight gain in males. Significant decreased absolute liver weights.	
				200 mg/L	Reduction in body weight gain; average weight gain was 51% of controls; decreased organ weights (absolute and relative); liver and spleen weights decreased in males and females.	

TABLE V-1 (cont.)

Mode of Administration	Species	Sex, Weight	Duration	Dose	Effect	Reference
Oral/drinking water	B6C3F1 mice	10/sex/group	90 days	12.5 and 25 mg/L	Decrease in MCV in females, decrease in Alk-P (25 mg/L) (neither effect considered treatment related).	Daniel et al., 1991
				50 mg/L	Decrease in MCV in females, significant decreases in Alk-P in males and significant increases in AST in females (none considered treatment related).	
				100 and 200 mg/L	Significant differences in weight gain and water consumption. Increase in lymphocytes in males and decrease in kidney and lung weights in both sexes. In males decreased absolute testes and spleen weights (200 mg/L). Also at 200 mg/L signficant increases in relative brain, kidney, lung and testes in males and brain and kidney in females.	
Oral/drinking water	Sprague-Dawley rats	12 males/dose, 100 g	9 weeks	9, 19 and 38 mg/L	Significant reduction in spleen weight (38 mg/L); decreased antibody synthesis (9 and 19 mg/L); augmented PGE2 production (19 and 38 mg/L)	Exon et al., 1987

*Samples were concentrated equal to the original concentrate (400x) or one-fourth of the original concentrate (100x). The original concentrate or monochloramine residual was 2.1 mg/L. The original concentrate of chloramines was not specified.

NS = Not specified

TABLE V-2

Summary of Studies on Chronic Oral Exposure to Monochloramine in Drinking Water

Species	Sex, Weight	Duration	Dose	Effect	Reference
Sprague-Dawley rats	4 males/group, 150-570 g	12 months	1 mg/L (~0.1 mg/kg bw/day)	Significant decrease in blood glutathione at 4, 6 and 12 months (27, 24 and 25%, respectively). No effect on blood osmotic fragility. No effect on blood cell compartment. Increase in [^{3}H]-thymidine incorporation in nuclei, significant in kidney (190%) and spleen (230%) but not liver, testes or intestinal mucosa, at 3 months. No effect on body weight.	Abel-Rahman et al., 1984
			10 mg/L (~1.0 mg/kg bw/day)	Significant decrease in blood glutathione at 6 and 12 months (20 and 24%, respectively); significant increase at 10 months (27%). Significant increase in blood osmotic fragility at 2 and 10 months (44 and 39%, respectively). Significant decrease in RBC count (8.8%) and HCT (11%) at 3 months, no effect on HGB, MCV, MCH or MCHC. Significant increase in [^{3}H]-thymidine incorporation in nuclei of kidney (290%) and spleen, (160%) but not other organs, at 3 months. No effect on body weight.	
			100 mg/L (~10 mg/kg bw/day)	Significant decrease in blood glutathione at 4, 6 and 12 months (20, 23 and 22%, respectively). Significant increase in blood osmotic fragility at 2 and 6 months (27 and 67%, respectively). Significant decrease in RBC count (8.8%) and HCT (12%) at 3 months, and decrease in HGB (22%) and MCH (23%) at 10 months. Significant increase in [^{3}H]-thymidine incorporation in nuclei of testes (200%) at 3 months. Body weight significantly reduced at 3-12 months (8.4-17%).	
F344/N rats	10/sex/group	2 years	50 ppm (2.1-2.8 mg/kg/day)	No treatment-related effects	NTP, 1990
			100 ppm (4.8-5.3 mg/kg/day)		
			200 ppm (8.7-9.5 mg/kg/day)	Lower mean body weights and decreases in liver and kidney weights in males and increases in brain and kidney-to-body weight ratios at 14- or 66-week evaluations.	

TABLE V-2 (cont.)

Species	Sex, Weight	Duration	Dose	Effect	Reference
B6C3F1 mice	10/sex/group	2 years	50 ppm (5.0-44.9 mg/kg/day)	No treatment-related effects	NTP, 1990
			100 ppm (8.9-9.0 mg/kg/day)		
			200 ppm (15.9-17.2 mg/kg/day)	Mean body weights of male mice were 10-22% lower after week 37 and body weights of female mice were 10-35% lower after week 8. At 15 or 66 weeks decreases in liver weights and increases in brain or kidney-to-body-weight ratios occurred.	

TABLE VIII-1

Summary of HAs and DWEL for Noncarcinogenic Effects

HAs and DWEL	Dose Level (mg/kg/day)	10 kg Child (mg/L)	70 kg Adult (mg/L)	Reference
1-Day HA	10	1[a]	--	Bercz et al., 1982
10-Day HA	10	1	--	Bercz et al., 1982
Longer-term HA	9.5	1	4[b]	NTP, 1990
DWEL	9.5	--	4	NTP, 1990

[a]Adopted from the 10-day HA

[b]Adopted from the DWEL